

REVIEW



Bibliometric Analysis of Climate Change and Agritourism Sustainability in Rural Destinations

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Abstract: Rural agritourism is increasingly studied in the context of climate change and sustainability. However, less attention has been paid to how it might assist local communities under pressure from climate change. The research literature spans a range of topics related to tourism, agricultural adaptation, rural development, and sustainability. This study examines the research structure to show how the field has developed and what topics still need more attention. Data covered publications from 1987 to 2025 and were collected on December 25, 2025. The search retrieved 216 documents from Scopus and 183 from Web of Science. After removing duplicates and one retracted document, a total of 281 documents were obtained. The study used performance analysis together with three mapping techniques. These included author co-citation, keyword co-occurrence, and strategic thematic mapping. A total of 226 documents were published after 2017. They represented 80.4% of the dataset. Rural tourism and climate change became the main themes. The co-citation results identified four intellectual foundations. Tourism development and agricultural adaptation formed two foundations, whereas institutional support and climate-tourism sustainability shaped the remaining two. The keyword network highlighted farm vulnerability and tourism sustainability. Management and destination adaptation were also prominent. Basic themes offer a general framework of the field, and rural tourism and climate change are the core references. Motor themes are agricultural risks and land-use effects. Their position shows an active research direction. Specialized management and adaptation remain niche themes. Low-centrality themes such as place attachment and smallholder views have limited connections with the wider thematic structure. Future studies should examine adaptive governance across climate zones. Smallholder responses to climate stress also require attention. The role of place attachment in rural adaptation should be explored.

Keywords: Climate change, agritourism, rural tourism, sustainability, bibliometric analysis

1. Introduction

In recent years, climate change is no longer a distant future threat but has directly affected the lives of rural people [1]. Traditional agriculture is facing many difficulties due to prolonged droughts, soil salinization, and increasingly severe heat waves [2]. In response to these pressures, adaptation needs to be considered, and agricultural tourism has become a means to help people earn extra income, besides farming, thus improving their lives to some extent [3, 4]. The sustainability of agritourism is often addressed in relation to environmental conservation, economic stability, and the well-being of the community [5]. Agritourism can also serve as an adaptation option when farm households use tourism income to reduce their dependence on agricultural production [6]. Adaptation, carbon mitigation, and a green transition in rural destinations may benefit from climate-smart agriculture and resource-efficient tourism services [7].

Furthermore, operational risks may arise when weather conditions affect the landscape and agritourism experience [8].

Schedule changes, unstable services, and restricted destination access may occur due to seasonal variations. Theoretically, the vulnerability approach focuses on defining the level of risk exposure, sensitivity, and the capacity of destinations to respond [9]. The “socio-ecological systems” perspective considers agritourism as a system of interconnections between the resources, livelihoods, and visitor behavior [10]. Meanwhile, the “resilience and adaptability” framework focuses on the ability to adjust operations to long-term shocks and changes [11]. Agritourism resources and adaptive farming are connected with climate exposure, while destination governance is perceived as a way of thinking about livelihood resilience. Thus, agritourism can act as a livelihood adaptation strategy and as a climate-exposed activity [6, 8].

However, agritourism sustainability, rural tourism development, and climate-related tourism have been considered separately [5, 12, 13]. Many climate change studies deal with crop yields and the corresponding risks [14], while agritourism is often concerned with the agricultural goods and activities related to tourism [12]. However, the term sustainability is widely acknowledged. Climate adaptation policies and practices still give limited attention to their integration [7, 13]. Despite the growing number of publications, most of them only focus on two of these three objectives. The

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previous literature reviews have not integrated the three research dimensions into the same framework. Therefore, the knowledge background and the relationships among these objectives are still unclear. Their roles in low-carbon rural development have not been addressed adequately.

From these gaps, the research aims to address three questions: **RQ1**: Which knowledge background and research dimensions have been used to connect climate change to agritourism? **RQ2**: How have related research topics been formed and connected? **RQ3**: How have these knowledge structures explained the resilience and sustainability in the rural destinations?

Recently, bibliometric methods have become increasingly relevant and applicable to rapidly expanding interdisciplinary fields. The research design collected data separately from Scopus and the Web of Science (WoS). The intellectual foundations of the key research topics are then examined using co-citation analysis. First, descriptive analysis shows the trend of publication growth, publication sources, and national distribution of literature [15]. Second, the keyword co-occurrence analysis determines conceptual clusters and links between climate effects, adaptation, and sustainability. Subsequently, strategic mapping classifies themes into four positions: motor, basic, niche, and emerging or declining themes. Climate risk, agritourism, and community adaptability are explored through the lens of their interconnections in the knowledge network. The findings become the basis for future research on the resilience of agritourism and low-carbon rural development in the context of climate change.

2. Literature Review

2.1. Transformations in the rural economies during the development of agritourism

Agritourism is often addressed in research on rural tourism. This kind of tourism is connected to activities of rural production and daily life on farms [3]. It connects the agricultural and livestock-based practices to visitor-based services, such as experiences on-site and learning events [16]. Several studies show that this paradigm will decrease the reliance on agricultural revenue and will enhance cyclical economic flexibility [17].

In reality, local resource conditions and community structures are very strong motivations behind agritourism in rural destinations [12]. In most cases, tourism activities take place in a production area, which demonstrates the relevance of land, environment, and family work [18]. Thus, prior studies treat agritourism as a social and ecological system whereby farming and tourism services are in constant interaction with each other [19]. The livelihoods and tourist experiences partly depend on the operation of production, resource use, and guest services [20]. In addition, the destinations have their own geographical and natural conditions, while the stability is affected by the relationships among farmers, communities, and supporting parties.

Therefore, when combining agritourism into rural development, studies often relate the conceptual framework to sustainable development adoption [21]. Economically, agritourism can create local jobs and increase the value of agricultural products through consumption at the destination [17, 22]. Socially, the plan promotes the protection of rural lifestyles and improves engagement between residents and tourists [23]. The agricultural operations and landscape management become the determinants of attractiveness and sustainability in the long term [6, 24]. However, such

limitations as small scale, seasonality, and reliance on natural conditions are still very widely reported [18].

Simultaneously, the characteristics of rural destinations make agritourism more sensitive when placed in the context of climate change. In addition, variability of weather and seasonality may influence production, landscapes, and the consistency of the visitor experience directly [25]. Farmers may use agritourism to earn additional income, although this income still depends on climate-sensitive production systems and landscapes [6, 18]. Decreasing this exposure could require climate-smart agriculture and low-carbon tourism services, which can help adaptation and low-carbon rural development [7, 26]. Tourism produces emissions through its operations and supply chains. However, sustainable tourism research has given comparatively little attention to climate mitigation [27].

2.2. Climate change impacts and sustainable development in agritourism

Climate change is emerging as a cause of concern in the operations of destinations in the context of agritourism. Weather variability, seasonality, and depletion of resources are very influential in farm activities and experiential services [28]. From this analytical perspective, climate change is recognized as a factor shaping the sustainability of products and offers a different perspective from the general environmental context [29]. This positioning issue expands the research direction from product development to considering long-term sustainability [21]. These stressors therefore affect the agricultural production, landscape quality, destination access, and visitor experience on which agritourism depends.

Sustainability is used to examine the effects of climate and the requirement for keeping livelihoods and the quality of the environment in the area of tourist operations [2, 30]. In agritourism, this issue relates to agricultural landscape conservation, the use of resources adequately, and the creation of community benefits [5]. Sustainability is also associated with most studies in terms of alleviating the stress on the ecosystem and enhancing the viability of livelihoods of residents [31]. However, these concepts are often inconsistent across publications, making comparisons between different research directions and knowledge axes difficult [30]. Exposed assets can be maintained provided institutions coordinate destination governance, and households have adequate resources to manage exposure [32, 33].

By contrast, research on agritourism resilience is still spread across different areas, including climate vulnerability, adaptive capacity, and sustainability [34]. Some studies focus on how particular places are affected by climate change and other environmental pressures [25]. More recent work has considered social issues, ecosystems, available resources, and tourist behavior in agritourism [22]. Adaptation and resilience offer another way to understand how practices may change under changing environmental conditions [32].

Together, these studies imply a chain of events from climate stressors through agritourism exposure and adaptive capacity to sustainability. The strength of these links may differ across climate zones due to variations in water risk, heat, and salinity, as well as resource access and institutional support [29]. Yet, few studies consider this sequence as a whole, limiting its use for interpreting the field's knowledge clusters. Climate-risk disclosure was investigated at the level of firms [35]. Additionally, a correlation between climate exposure and supply-chain finance has

been detected [36]. Their relevance to agritourism livelihoods and destination governance remains unclear.

2.3. Relationships among climate exposure agritourism adaptation and rural sustainability

Livelihood diversification and rural development are the two main topics in rural tourism research. In another approach, climate research pays more attention to exposure levels, vulnerability, and adaptability. The two approaches address rural change, but their relationship has not been clearly explained. Income from tourism can help farmers adjust their livelihood activities. Meanwhile, climate-sensitive production and rural landscapes still influence agritourism activities. Access to destinations and visitor conditions can also change due to climate stressors. In this dual role, a common analytical perspective needs to be considered on adaptation and climate exposure [37]. The relationship flows in the context of rural social-ecological systems. Household resources and social capital relate to local community responses, and institutions and governance facilitate collective adaptation [38]. Appropriate farming practices and improved use of resources may support adaptive capacity in the context of climate-smart agriculture [7]. When adaptability is enhanced, livelihoods may become more stable and environmental conditions may positively improve. Other sustainability outcomes include community well-being and visitor continuity. The green economy in rural areas has traditionally been viewed through three familiar perspectives. They concern responses to climate pressure and rational resource use as well as efforts to reduce carbon emissions. This perspective is not necessarily wrong. Yet many studies still treat these three perspectives separately even though they may be closely linked in practice. Therefore, to envision a direction for low-carbon rural areas, an analytical framework is needed that places all three together instead of discussing them individually as in previous studies [26]. However, carbon neutrality is not a uniform goal for all places. Emission levels vary between geographical regions; therefore, each locality needs an approach suitable to its own circumstances and cannot apply a single framework [39, 40]. Figure 1 provides an overview of the main issues considered in this study and shows how they are organized within the analytical framework.

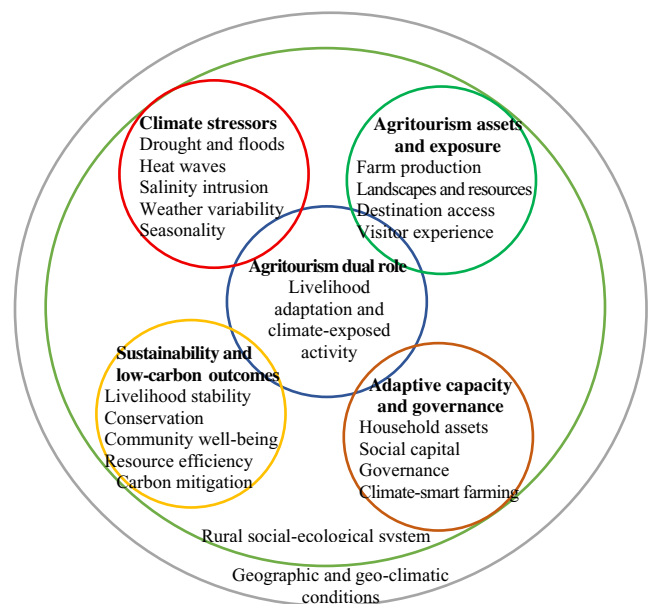
3. Research Methodology

3.1. Research design

Bibliometric analysis was used to explore the literature on climate change and agritourism. Publication performance was examined first to describe the main patterns in the collected studies. Author co-citation analysis was then used to identify the intellectual foundations of this research area. Keyword co-occurrence analysis shows conceptual links among research themes. Strategic thematic mapping organizes the themes based on the centrality and density of Callon.

The search strategy contains three groups of terms. The first keyword layer represents tourism-related concepts, including the terms agritourism and rural tourism. The second is climate stressors and extreme weather events associated with climate. The final group covers response and outcome mechanisms, including vulnerability, adaptation, resilience, sustainability, and mitigation. Rural tourism terms were retained because agritourism research is frequently found in the broader context of rural destination research. Low-carbon terms were used as analytical outcomes

Figure 1
Conceptual framework for agritourism resilience and low-carbon rural development



rather than as an addition to the search terms. This maintains the climate-agritourism focus and allows carbon-related themes to emerge within the corpus.

3.2. Data collection strategy

The search was conducted in Scopus and across all indexes available in the Web of Science Core Collection [41]. Records were retrieved through TITLE-ABS-KEY in Scopus, while the Topic field (TS) was used in WoS. The bibliographic data were collected for the publications between 1987 and 2025; the last search of the databases was made on December 25, 2025. Only English-language records were retained. There was no restriction placed on the subject category, and all document types indexed were included [42].

The same three-group query was adapted to each database and applied to the specified fields [43]. The records were exported in formats that can be combined and used for bibliometric analysis. The general Boolean structure was (agritourism OR "rural tourism" OR "agro tourism" OR "agricultural tourism" OR "farm tourism" OR "farm-based tourism" OR "farm visitor*" OR "farm visit*" OR "farm experience*" OR farmstay* OR "farm stay*" OR "working farm*") AND ("climate change" OR "global warming" OR "climate variability" OR "climate risk" OR "climatic change" OR "climate-related" OR "weather variability" OR "extreme weather" OR "extreme event*" OR "climate extreme*" OR drought OR flood* OR heatwave* OR "heat wave*" OR wildfire* OR storm* OR cyclone* OR typhoon*) AND (impact* OR effect* OR consequenc* OR implication* OR vulnerab* OR susceptib* OR exposure OR sensitivity OR risk* OR hazard* OR "risk assessment" OR "risk perception" OR adapt* OR "adaptive capacity" OR coping OR "risk management" OR resilien* OR "adaptive resilience" OR sustainab* OR "sustainable development" OR "environmental sustainability" OR mitigation OR "climate mitigation").

A total of 216 records were retrieved from Scopus and 183 records from WoS. Records were merged with mergeDbSources

in R. DOI and normalized title were used for duplicate detection. This process removed 117 duplicate records and resulted in 282 records. One record was then retracted, resulting in 281 documents for analysis. Details of the search protocol and the construction of the dataset are included in Table A1 (Appendix). Conference papers, reviews, book chapters, and early-access papers were kept when fulfilling the predefined search and language criteria. Rural tourism records were kept only when the climate and response term groups were also met. The identification, duplicate removal, retraction screening, and final inclusion process is summarized in Figure 2. Detailed corpus characteristics are reported in Table A2 (Appendix).

3.3. Data analysis

The data were analyzed in four stages. First, annual publications, fractionalized author productivity, cited documents, and corresponding-author countries were summarized. The next stage used author co-citation and keyword co-occurrence to explore the intellectual and conceptual structures of the literature. Strategic thematic mapping positioned themes within the wider knowledge structure. Processing was conducted in R 4.5.2 with bibliometrix 5.0 [44] and VOSviewer 1.6.20 [45].

Author co-citation analysis was used to identify intellectual foundations through citation relationships among authors [46]. The analysis of cited authors was carried out in VOSviewer using a full counting method with a minimum threshold of 10 citations. Association-strength normalization, resolution 1.00, and a minimum cluster size of three were applied. Small clusters were merged. Of 10,116 cited authors, 37 met the threshold. Two unconnected authors were excluded, leaving 35 nodes in four clusters. A light thesaurus was created to standardize author name variants without conflating different authors.

Keyword co-occurrence analysis was conducted to identify the co-occurrence of keywords plus terms and the formation of concept clusters. VOSviewer used full counting, a minimum of three occurrences, and association-strength normalization. The clustering resolution was 1.00, the minimum cluster size was 12, and small clusters were merged. The corpus was comprised of 1,120 Keywords Plus terms, and 111 of those met the occurrence threshold prior to thesaurus cleaning. The thesaurus normalized variants like climate change, rural tourism, farms, and soils. Generic, bibliometric, and location-specific terms were removed when they did not represent the study concepts. After cleaning, the connected network contained 82 nodes in five clusters.

Strategic thematic mapping used author keywords with a minimum frequency of five. Callon centrality represents a theme’s external connections, while Callon density represents its internal development. These measures position themes as motor, basic, niche, or low-centrality themes [46]. Low-centrality themes were not taken as emerging or declining in the absence of time-sliced evidence. The internal stability was measured using 100 bootstrap samples, with each sample containing 80% of the 281 documents. Fifty baseline term frequency-inverse document frequency (TF-IDF) terms and a minimum document frequency of five were used. Mean top-term retention was 0.887 and mean Jaccard similarity was 0.799, indicating stable dominant terms across resamples.

4. Results

4.1. Summary of the scientific data

The study collected data from WoS and Scopus. A basic description of the dataset used is shown in Figure 3. The analysis results are presented in Tables A3–A6 of the Appendix.

Figure 2
Workflow for database screening and bibliometric analysis

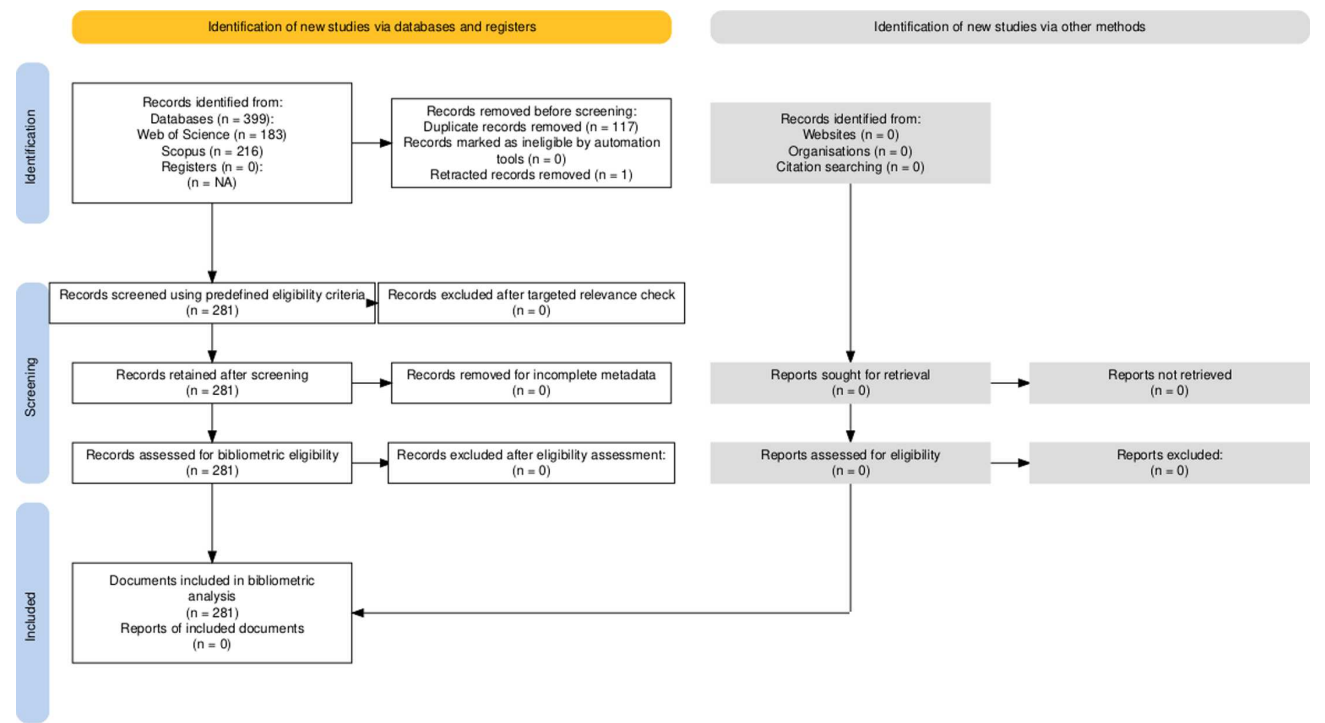
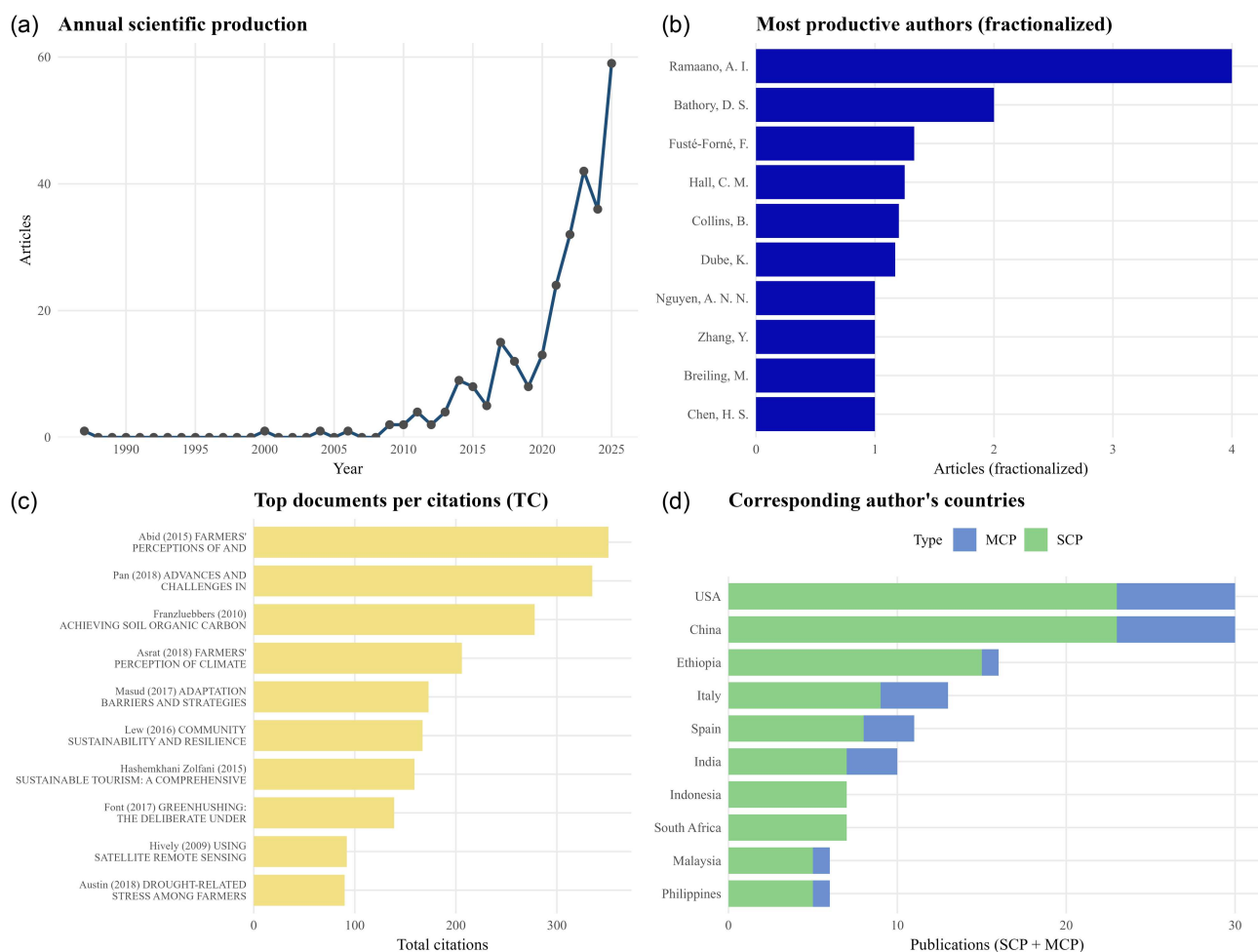


Figure 3

Descriptive analysis of the scientific literature: (a) annual scientific production; (b) most productive authors (fractionalized); (c) top documents by total citations; and (d) corresponding authors' countries



First, the literature produced in this area was very limited and remained insignificant for many years. It began to rise in 2017 and grew rapidly between 2021 and 2025. The annual growth rate was 11.33%, and the number of documents published in 2025 was 59. This shift might be a response to growing interest in climate adaptation, livelihood diversification, and rural sustainability.

Secondly, the data on author productivity indicate that knowledge production is diffused and not dominated by a few groups [47]. The most prolific author recorded a fractionalized publication count of 4, while the other authors had fractionalized values between 1 and 2.

Meanwhile, the distribution of citations remains concentrated toward a few highly cited publications. The leading documents received 351 citations [48], 335 citations [26], and 278 citations [49]. The number of citations declines sharply for lower-ranked studies such as 200 citations and 90 citations. There seems to be some unevenness in scholarly influence within the field.

Finally, the analysis of corresponding-author countries shows that the USA and China each recorded 23 single-country publications (SCP) and 7 multiple-country publications (MCP) documents. Ethiopia reported 15 SCP documents and one MCP document. SCP was the most common in the major countries, with MCP publications varying by country. The visibility of these countries may indicate variations in climate exposure, development priorities in rural areas, and research investments. However,

the pattern provides limited evidence of national research capacity because it only covers publications in English indexed in Scopus and WoS. In brief, authorship is spread among numerous small groups and international collaboration is less consistent between countries.

4.2. Results of the author-based co-citation structure analysis

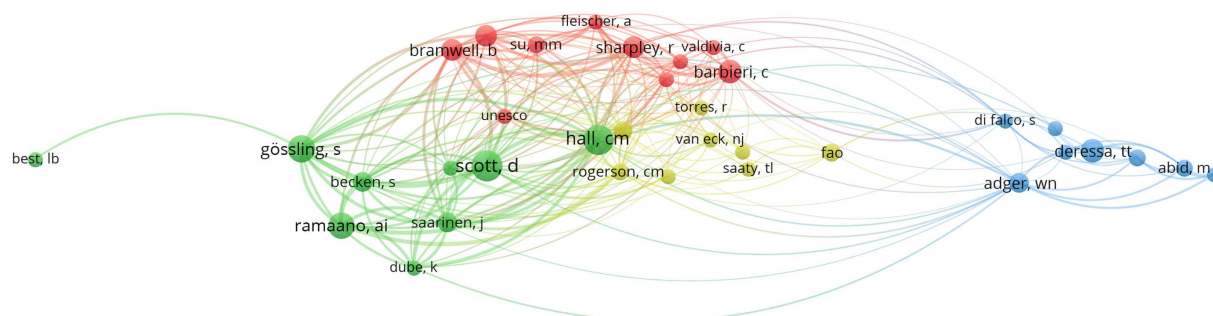
An author co-citation analysis was carried out to examine the intellectual structure of the field. Detailed results are summarized in Table A7 in the Appendix.

Figure 4 shows the most influential cited authors and their relationships within the co-citation network. Cluster 1 represents tourism and rural development. The high link strengths of Bramwell (225), Sharpley (178), and Lane (156) show the importance of destination governance and rural restructuring [50–52].

Cluster 2 brings together agriculture and adaptation research [48, 53–55]. It shifts the discussion of structure to focus on farm vulnerability, adaptive capacity, and rural livelihoods.

Cluster 3 is a grouping of institutional and analytical sources. FAO (2017) and UNWTO (2019) provide institutional guidance [56], while Rogerson (2016) forms a strong connection with a total link strength of 139 [57]. The inclusion of van Eck, Saaty,

Figure 4
Author co-citation network of the research field



Note: The analysis used full counting with a minimum threshold of 10 citations. The network included 35 connected authors, association-strength normalization, a clustering resolution of 1.00, and a minimum cluster size of three.

and Ajzen indicates reliance on general analytical and decision frameworks.

Cluster 4 is the node that connects climate and tourism research in the co-citation network. Scott received 49 citations and a total link strength of 302 [58], while Hall has 44 (280) [59] and Gössling has 36 (253) [60]. Following re-clustering, the former two-author group of Gössling and Best was absorbed into this cluster [61]. Its more robust position suggests that climate–tourism and sustainability studies lie at the heart of the co-citation network.

Based on the co-citation analysis, four major clusters are identified. The first two revolve around tourism development and the adaptability of agricultural production; the remaining two focus on institutional support, analysis, and climate–tourism sustainability. The presence of all four clusters indicates that climate change has gradually gained attention in agritourism research, rather than just remaining a background context. Notably, these clusters are relatively separate, with few studies presenting a combined analysis of climate, farm-level adaptive capacity, and destination management. This is a gap that further research could explore.

4.3. Relevance associations within keyword co-occurrence network

The analysis of keywords was carried out through co-occurrence and the strength of the linkage to determine the topics and the relationships of different topics in the dataset. Detailed results are summarized in Table A8 in Appendix A.

Figure 5 shows the network of links between keywords, occurrence metrics, and total link strength used to categorize them by clusters and different colors.

Cluster 1 focuses on research on agritourism linked to agriculture and climate vulnerability [17]. The key keywords include “agriculture” (22; 70), “vulnerability” (18; 51), and “agritourism” (17; 56), which are linked together in terms of farm activities and climate responses [62]. This is a cluster formed from keywords related to the decision-making and strategies of farmers in the context of climate change [18, 48].

In terms of tourism, Cluster 2 demonstrates that there are relationships among keywords in publications on tourism and sustainability [63]. Keywords in this group with high levels of association include “tourism” (20; 69), “sustainability” (12; 40), and “sustainable development” (11; 33), whose meanings relate to tourism development and environmental goals [64]. The cluster can be identified to explain how sustainability and environmental pressures are considered in tourism development [21].

Moreover, Cluster 3 represents the research strand on climate change and farm vulnerability [65]. “Climate change” (70; 194), “farm” (14; 39), and “drought” (9; 28) serve as key keywords, connecting issues of environmental pressure, farming, and ecosystems [2]. In this cluster, climate change forms the main connection between agricultural activities and environmental risks [28, 66].

Alternatively, Cluster 4 is concerned with management, perception, and policy [67]. The keywords “management” (32; 94) and “perception” (21; 81) represent research on decisions and responses to climate effects [68]. This cluster involves the management and policy dimensions in analyzing tourism development [33].

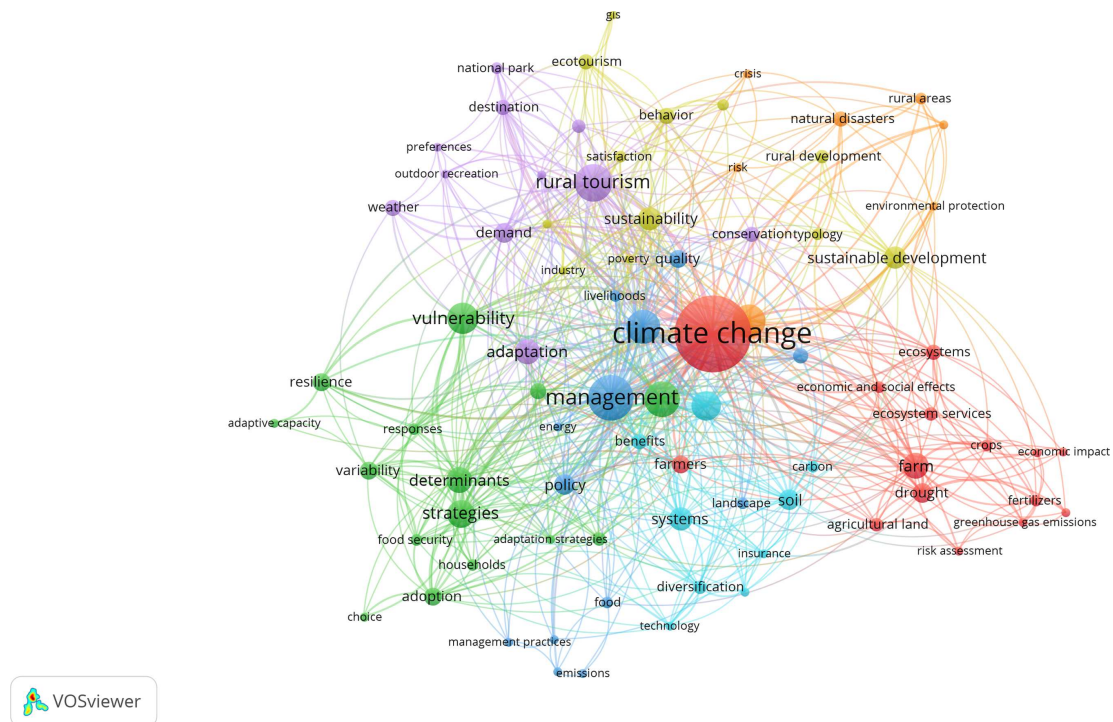
At the conceptual framework level, Cluster 5 revolves around “rural tourism” (24; 76), “adaptation” (13; 44), and “demand” (9; 33) [69]. This cluster is directly related to the other clusters and indicates that rural tourism provides an application setting for adaptation, destination demand, and weather conditions [25, 29].

In general, the discussions of the created clusters show an organized interconnection. Climate change is recognized as a linking area, whereas agritourism and rural tourism are the areas of application. This suggests that climate resilience is being explored through the lens of farm vulnerability, tourism sustainability, management, and destination adaptation. However, governance and community responses have a relatively limited presence in the network.

4.4. Strategic positions of research themes

The research themes were positioned according to their centrality and level of development. Table A9 in the Appendix

Figure 5
Co-occurrence network of keyword clusters



Note: This result visualizes a network of 82 connected keywords that had at least three occurrences. The analysis used full counting, association-strength normalization, a clustering resolution of 1.00, and a minimum cluster size of 12.

presents the classification and main characteristics of each thematic group.

Figure 6 identifies the distribution of keywords in the process of forming interdisciplinary knowledge partitions.

First, basic themes provide a general guideline for understanding the field and the dominant research directions. In particular, “rural tourism” shows high centrality and low density (15.376; 69.139), reflecting its broad connections across rural tourism research [70]. “Climate change” has a similar position (13.876; 56.848), indicating wide external connections but limited internal development [71].

Against that backdrop, the motor themes group revolves around well-developed topics with strong internal relationships. Research on farmers’ perceptions and adaptation supports the climate-risk dimension of this group [48]. This pattern is observed in “drought” (8.601; 89.644), “cultivation” (2.521; 112.083), and “agricultural land” (1.944; 109.524), which reflect the effects of drought on agricultural systems [66].

In contrast, niche themes display low centrality and high density and show a contextual or methodological focus. “Adaptive management” (0.250; 128.125) concerns adaptation and mitigation responses in rural tourism destinations [71]. Meanwhile, “tourism management” (0.500; 77.083) relates to sustainable tourism and green economy practices [26]. These are discussions with a management focus that are internally mature but less linked with the main research area.

Finally, the low-centrality themes have weak external connections and relatively low internal development. “Place attachment” (0.167; 69.444) represents emotional and social ties within rural tourism destinations [72]. In comparison, “smallholder” (0.917; 50.000) reflects rural farm networks and adaptation [73].

Overall, the themes of rural tourism and climate change show stronger external connections, and the themes of climate risks and agricultural production are more developed internally. More distinct thematic positions are evident for adaptive and tourism management. Place attachment and smallholder research have relatively limited ties to the thematic structure.

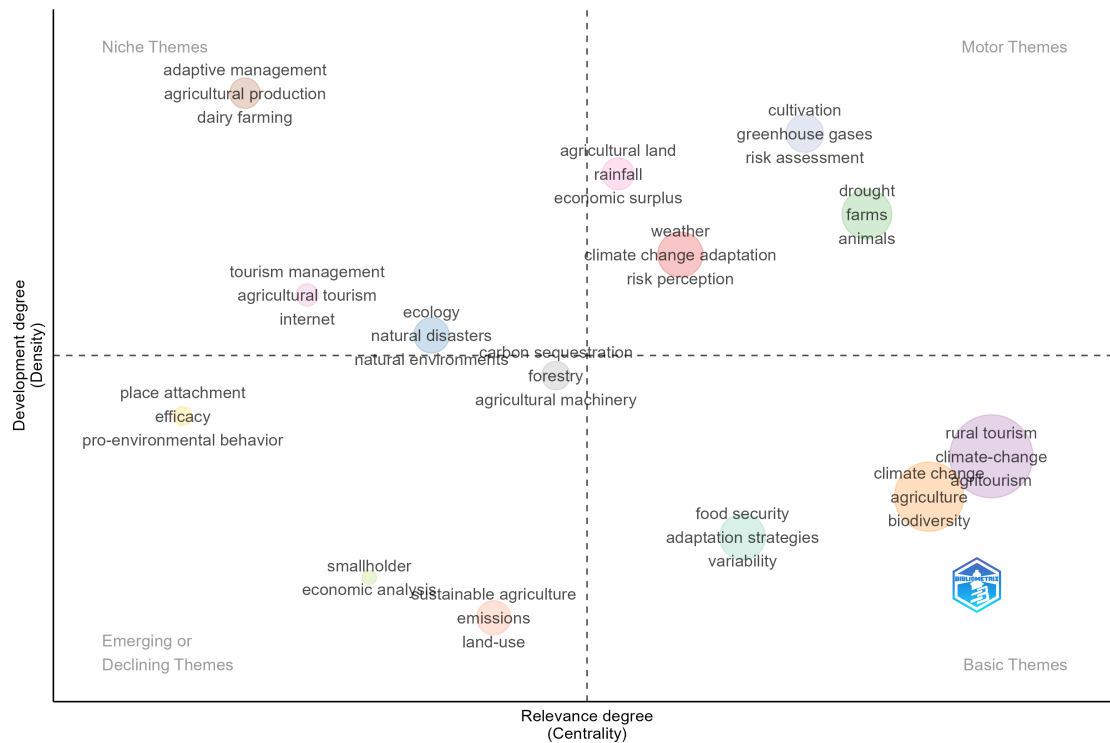
5. Discussion

During changing climate conditions, related pressures pose challenges for rural farming communities. Farm households may find another option through agritourism, helping them cope with these pressures while maintaining their resilience. Previously, this topic has often been studied through tourism development, agricultural adaptation, destination management, and sustainability. In both the agricultural and tourism sectors, environmental changes have been frequently researched. However, the connection between these changes and agritourism remains unclear in the existing literature. Differences between farms in terms of climate exposure and capacity to adapt have received less attention.

5.1. Connections between rural tourism and climate change

The analysis of the basic themes reveals that “rural tourism” and “climate change” form the main thematic direction. “Rural tourism” represents the application space where tourism activities draw on rural livelihoods and local resources [63]. Meanwhile, the term “climate change” refers to external forces impacting natural conditions and the long-term stability of rural locations [29]. Their

Figure 6
Strategic landscape of research topics



Note: Values are reported in the order of Callon centrality and Callon density. The lower-left quadrant is considered low centrality as no time-sliced analysis was performed.

common location indicates that rural tourism is frequently studied as a climate change vulnerable setting.

The high level of centrality indicates that these topics occupy a fairly wide position in the knowledge network, but low density indicates limited internal development. Rural tourism and climate change are often studied in relation to destination resilience. However, models explaining the relationship between these contents and agricultural tourism activities are still quite limited [5]. Therefore, despite appearing in many different research directions, these topics have not yet been clearly developed in terms of theory and research methods.

From these results, the next research step would be to further develop the climate-risk approach in rural destinations. Spatial planning is a logical entry point, as it allows for the handling of environmental pressures, local resources, and destination development orientation within the same decision-making process instead of separately [74]. However, the same level of risk can lead to very different responses, depending on the adaptive capacity, level of institutional support, and characteristics of each locality, in which geographic and climate are two variables that cannot be ignored when comparing destinations [37]. The socio-ecological framework offers one way to address this, with climate conditions, farm-level adjustments, and destination management activities considered together [38].

5.2. Climate risks in agricultural systems

The motor themes focus on risk assessment in agricultural systems, represented by “drought,” “cultivation,” and “agricultural land.” Together, these concepts point to possible climate-related pressures on agricultural sustainability [7]. In

destinations that depend on agricultural production and farming landscapes, climate change affects productivity and farming methods [14]. Similar transformations can also apply to tourism related to seasonal conditions, farm experiences, and rural landscapes.

Within this thematic group, the keywords show a close connection between climatic conditions and farming activities. Drought can change production schedules and land use, thereby affecting cultivation and the management of agricultural land [66]. Land degradation and production changes may also place pressure on rural livelihoods [75]. This can affect crop cultivation and farmland management while also disrupting farm-based experiences and their income. These related pressures may help explain the strong connection and development of this thematic group on the strategic map.

Land use conditions and agricultural production must be placed alongside climate information when considering local resilience [76]. From risk identification, analysis can move to institutional responses and how localities maintain sustainability. For farms, agritourism generates additional revenue but remains dependent on climate-sensitive production activities [6]. Part of the pressure can be reduced through climate-smart farming [7]. On the tourism side, efficient resource use can be linked to carbon reduction and green economy goals [26]. In such cases, analysis must take into account physical risks, institutional responses, and community conditions instead of just looking at environmental factors.

5.3. Decision-making and adaptive governance

Niche themes associated with specific responses to climate uncertainty include adaptive management and tourism

management. These themes suggest that the discussion is focused on how destinations adapt their practices and resources and not yet on a fully connected governance framework [77]. Institutional coordination also shapes resource management and long-term development in rural destinations [50]. Thus, these topics form a specialized group around organizational capacity and science-policy processes [33].

Internal development in this cluster is mainly discussed through flexible planning, resource allocation, and multi-stakeholder coordination. Additionally, their density reflects the level of discussion within specific governance frameworks and the difference in planning criteria and implementation tools [11]. Thus, this specialization can also limit the transfer of knowledge from individual cases and its connection with other climate and tourism research. These approaches can be transferred more or less easily, depending on institutional capacity and local climatic conditions.

Climatic conditions, the local authorities' management capacity, and the operation of tourism could be considered side by side in the next research direction. In practice, they might change at the same time instead of separately. Then, drought or agricultural land degradation may no longer be solely a matter for the agricultural sector but may be linked to how a destination organizes and sustains tourism. The difference between regions with different climates may also vary according to household resources, local support, and social networks. This could bring topics which have long been under discussion into the mainstream research.

5.4. Social dimensions of smallholders and place attachment

The analysis identifies “smallholder” and “place attachment” as low-centrality themes, bringing in social and economic aspects to climate and sustainability research. These themes emphasize community resilience and adaptability in rural tourism [19]. They have limited external links, indicating that local responses are weakly connected with environmental and management research. Risk perception by farmers also indicates that adaptation is affected by local behaviors and measures [67].

In terms of meaning, this thematic group opens up a different perspective on the sustainability of rural tourism. The term “smallholder” refers to the capacities and constraints of farm households facing climate risks [78]. Smallholder networks can also shape the flow of information and adaptation advice [73]. In contrast, place attachment reflects residents' emotional and social connections to rural places [72]. These concepts can be combined to explain the various community responses to climate pressures. Adaptation is also related to people's responses to climate impacts, rather than the impacts themselves.

In this context, low centrality does not necessarily mean that a theme is emerging or declining. It mainly shows weak links with other themes and limited integration into the broader research field [79]. Place attachment and community involvement may also be factors in destination stability. These social dimensions should be connected to research on governance and climate risk in the future. This can then be understood in a social-ecological perspective, helping to explain the differences in household resources, institutions, and place relationships between geographic and climatic contexts.

6. Conclusion and implications

This study applies bibliometric techniques to examine the knowledge structure connecting agritourism, climate change, and

sustainability in rural tourism destinations. The results indicate that rural tourism provides the general context and that climate change gives rise to several research directions. The field is still divided between agricultural risks and management responses and the social situation of rural destinations. There is limited connection between climate exposure, farm adaptation, destination governance, and social resilience in the literature. A consistent analytical framework linking climate risk, sustainability goals, and agritourism operations is still lacking. This can be bridged to help advance climate-resilient agritourism and low-carbon rural development.

6.1. Theoretical implications

The theoretical contribution consists of the reading of the thematic positions in four related layers. The demands on agricultural resources, production schedules, and rural landscapes have arisen due to climate exposure. Farm adaptation covers cultivation practices, livelihood diversification, and responses to environmental changes. Governance of the destination has effects on the coordination of resources, planning, and participation of stakeholders [38]. Social resilience reflects smallholder capacity, community networks, and relationships with rural places [37]. These four layers can be viewed as interdependent parts of a social-ecological system.

According to this approach, adaptive governance can provide a connection between exposure to climate change and adjustments to tourism and rural livelihoods. The relationships may differ in strength across rural destinations due to geographic and climatic conditions. Low centrality of positions of smallholders and place attachment suggest an integration gap rather than an emerging trend. Therefore, the current theoretical framework needs to be broadened and should not be limited to environmental impact assessments. To understand destination resilience, a deeper look is needed into household resources, institutional support, and people's attachment to their place of residence. In other words, instead of simply grouping topics, research should aim to build a theoretical framework that can be validated with real-world data.

6.2. Policy and managerial implications

Local governments may produce drought, heat, and flood exposure maps using geographic information systems, satellite data, and community knowledge. These maps can inform agricultural land use, agritourism sites, access to water facilities, and emergency access planning [80]. Common early-warning platforms could link the meteorological services, the agricultural offices, destination managers, and rural communities. Local authorities should also engage residents in vulnerability assessment and in setting investment priorities. Their involvement can add social and livelihood data in addition to climate data [81].

At the same time, climate information might be considered in destination operations in seasonal planning. Visitor schedules, farm activities, and outdoor experiences may be modified when extreme conditions impact safety or product quality. Timely updates on schedule changes and environmental risks can be delivered through digital alerts, along with information on alternative activities. Further, managers should first measure tourism-related emissions before establishing emission reduction targets for key operations [82]. Green Economy objectives might also inform destination adaptation in relation to renewable energy and local food sourcing, water-saving equipment, and low-emission transport [26].

At the farm level, agritourism should be included in a larger livelihood strategy. Households can integrate tourism revenue with diversifying their crops, adopting water-saving farming practices, and using climate-smart agriculture practices [6, 7]. Low-cost sensors and digital advisory services can aid in monitoring soil moisture levels, rainfall, and production schedules [83]. Producer networks can also disseminate alerts and experience in training and adaptation to other rural communities. However, technology adoption depends on connectivity, investment costs, digital skills, and trust in the available data [84]. Smallholder farms may be excluded from such measures, but targeted training and shared equipment might minimize this.

6.3. Limitations and future research

This study has several limitations that need to be considered when interpreting the keyword mapping and thematic structure. Scopus and WoS provide broad coverage, but documents indexed elsewhere were not included. The use of only English publications may further undervalue knowledge in climate-sensitive rural areas. The search boundaries may have excluded relevant studies of rural tourism or papers using different terms for agritourism. The keyword-based bibliometric approach reflects term use in titles, abstracts, and keywords rather than the theoretical quality of individual studies. Moreover, the thematic map is a reflection of the accumulated literature and cannot be used to conclude whether the low-centrality topics are emerging or declining. Therefore, findings should be considered as patterns of structures rather than causal relationships or verified changes over time.

Based on this, future research could combine bibliometric evidence with systematic content analysis, interviews, surveys, and destination case studies. Time-sliced co-word analysis can help to identify whether the themes of smallholder and place attachment strengthen over time. Spatial climate, land-use, and agricultural production data could also be combined with household and destination indicators [76]. Each region faces different climate risks; some are prone to drought, others to flooding, and still others to prolonged heatwaves. Adaptation strategies present challenges in implementation, as each region faces unique challenges due to its specific characteristics and the different types of risks encountered. Therefore, the relationship between adaptation management and specific climate conditions requires further study. Furthermore, there are gaps in understanding whether farmers and destination managers utilize digital tools, such as risk maps, advisory systems, or emissions tracking applications, and how they use these tools in decision-making. Clarifying these aspects will answer the larger question: how does agritourism contribute to climate adaptation and carbon reduction in rural areas, and in what context does this occur?

Acknowledgment

The authors would like to thank the Industrial University of Ho Chi Minh City for their support and for providing the time and favorable conditions needed to enhance research capacity.

Ethical Statement

This study does not contain any studies with human or animal subjects performed by any of the authors.

Conflicts of Interest

The authors declare that they have no conflicts of interest to this work.

Data Availability Statement

The data used in this study were retrieved from the Scopus and WoS databases and are available at <https://data.mendeley.com/preview/mmw9793p9c?a=5c2a417c-432a-4df9-b9bd-c30818e>. The dataset supporting Table A5 is available in the Mendeley Data repository at <https://data.mendeley.com/datasets/mmw9793p9c/1>

Author Contribution Statement

Ninh Van Nguyen: Conceptualization, Methodology, Software, Validation, Formal analysis, Investigation, Resources, Data curation, Writing – original draft, Writing – review & editing, Visualization, Project administration. **Tran Van Tam:** Writing – original draft, Writing – review & editing.

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How to Cite: Nguyen, N. V., & Tam, T. V. (2026). Bibliometric Analysis of Climate Change and Agritourism Sustainability in Rural Destinations. *Green and Low-Carbon Economy*. <https://doi.org/10.47852/bonviewGLCE620210202>

Appendix. Results of Bibliometrix Analysis

Table A1
Search protocol and dataset construction

Index and search field	Search date	Filters and coverage	Initial records	Duplicate processing	Final dataset
Scopus; TITLE-ABS-KEY	25-Dec-25	English; records through 2025; no subject restriction; all document types	216	Merged with WoS using DOI and normalized title	–
Web of Science Core Collection (TS)	25-Dec-25	English; records through 2025; no subject restriction; all document types	183	Merged with Scopus using DOI and normalized title	–
mergeDbSources()	Jan-10-2026	1987–2025	399	117 duplicates removed	282
Scan titles	Jan-10-2026		282	1 retracted	281

Table A2
Information about dataset

Description	Results
Timespan	1987:2025
Sources (journals, books, etc.)	182
Documents	281
Annual growth rate %	11.33
Document average age	5.09
Average citations per doc	17.58
References	13609
Keywords Plus (ID)	1120
Author's Keywords (DE)	969
Authors	1002
Authors of single-authored docs	31
Single-authored docs	35
Co-authors per doc	3.72
International co-authorships %	19.57
Article	195
Article; book chapter	7
Article; early access	8
Article; proceedings paper	2
Book	4
Book chapter	19
Conference paper	22
Conference review	7
Editorial material	1
Erratum	1
Review	14
Review; early access	1

Table A3
Detailed annual publication data

No.	Year	Articles
1	1987	1
2	2000	1
3	2004	1
4	2006	1
5	2009	2
6	2010	2
7	2011	4
8	2012	2
9	2013	4
10	2014	9
11	2015	8
12	2016	5
13	2017	15
14	2018	12
15	2019	8
16	2020	13
17	2021	24
18	2022	32
19	2023	42
20	2024	36
21	2025	59

Note: Years without publications have been omitted for greater conciseness. Source: Author's analysis (2026)

Table A4
Most productive authors

Author	Articles fractionalized
Ramaano, A. I.	4.00
Bathory, D. S.	2.00
Fusté-Forné, F.	1.33
Hall, C. M.	1.25
Collins, B.	1.20
Dube, K.	1.17
Nguyen, A. N. N.	1.00
Zhang, Y.	1.00
Breiling, M.	1.00
Chen, H. S.	1.00

Table A5
Top documents per citations (TC)

No.	Documents	Total citations
1	Abid (2015). Farmers' perceptions of and adaptation strategies to climate change and their determinants: The case of Punjab province, Pakistan	351
2	Pan (2018). Advances and challenges in sustainable tourism toward a green economy	335
3	Franzluebbers (2010). Achieving soil organic carbon sequestration with conservation agricultural systems in the southeastern United States	278
4	Asrat (2018). Farmers' perception of climate change and adaptation strategies in the Dabus watershed, North-West Ethiopia	206
5	Masud (2017). Adaptation barriers and strategies towards climate change: Challenges in the agricultural sector	173
6	Lew (2016). Community sustainability and resilience: Similarities, differences and indicators	167
7	Hashemkhani Zolfani (2015). Sustainable tourism: A comprehensive literature review on frameworks and applications	159
8	Font (2017). Greenhushing: The deliberate under communicating of sustainability practices by tourism businesses	139
9	Hively (2009). Using satellite remote sensing to estimate winter cover crop nutrient uptake efficiency	92
10	Austin (2018). Drought-related stress among farmers: Findings from the Australian Rural Mental Health Study	90

Table A6
Top 10 Corresponding author's countries

No.	Country	SCP	MCP
1	USA	23	7
2	China	23	7
3	Ethiopia	15	1
4	Italy	9	4
5	Spain	8	3
6	India	7	3
7	Indonesia	7	0
8	South Africa	7	0
9	Malaysia	5	1
10	Philippines	5	1

Table A7
Results of the author co-citation network analysis

Cluster	Nodes	Leading cited authors	Citations	Total link strength
1	10	Barbieri C.; Bramwell B.; Lane B.; Sharpley R.; Su M.M.	26; 22; 22; 22; 13	100; 225; 156; 178; 62
2	8	Deressa T.T.; Adger W.N.; Bryan E.; Abid M.; Di Falco S.	26; 19; 14; 13; 11	50; 80; 55; 65; 39
3	8	UNWTO; FAO; Rogerson C.M.; Saaty T.L.; van Eck N.J.	16; 15; 14; 11; 10	70; 22; 139; 13; 45
4	9	Scott D.; Hall C.M.; Gössling S.; Ramaano A.I.; Saarinen J.; Becken S.	49; 44; 36; 34; 18; 18	302; 280; 253; 240; 221; 172

Table A8
Representative keywords have occurrences and total link strength above 3

Cluster	Keywords	Occurrences	Total link strength
1	Agriculture	22	70
	Vulnerability	18	51
	Agritourism	17	56
	Strategies	15	60
	Determinants	14	47
	Systems	12	32
	Soil	10	35
	Adoption	8	30
	Variability	8	24
	Resilience	8	20
2	Tourism	20	69
	Sustainability	12	40
	Sustainable development	11	33
	Behavior	7	23
	Ecotourism	6	17
	Natural disasters	6	17
	Rural development	5	8
	Rural areas	4	12
	Satisfaction	4	12
	Typology	4	9
3	Climate change	70	194
	Farm	14	39
	Drought	9	28
	Farmers	8	19

Table A8
(Continued)

Cluster	Keywords	Occurrences	Total link strength
4	Ecosystems	6	24
	Agricultural land	5	15
	Ecosystem services	5	15
	Fertilizers	4	16
	Crops	4	15
	Economic and social effects	4	14
	Management	32	94
	Perception	21	81
	Policy	10	33
	Quality	8	24
	Biodiversity	6	20
	Livelihoods	4	18
	Food	4	10
	Landscape	4	8
	Energy	3	9
	Land use	3	7
5	Rural tourism	24	76
	Adaptation	13	44
	Demand	9	33
	Weather	7	13
	Destination	6	25
	Conservation	6	22
	Sustainable tourism	5	17
	National park	4	14
	Communities	3	13
	Outdoor recreation	3	11

Table A9
Centrality density characteristics of research clusters

Cluster	Callon centrality	Callon density	Rank centrality	Rank density	Cluster frequency
Weather	1.958	82.509	9	10	47
Ecology	1.257	75.087	5	8	23
Drought	8.601	89.644	12	11	65
Rural tourism	15.376	69.139	14	5	723
Climate change	13.876	56.848	13	4	265
Adaptive management	0.250	128.125	2	14	16
Agricultural land	1.944	109.524	8	12	18
Carbon sequestration	1.500	75.000	7	7	14
Food security	2.178	55.360	10	3	49
Sustainable agriculture	1.279	49.074	6	1	21
Cultivation	2.521	112.083	11	13	27
Tourism management	0.500	77.083	3	9	9
Smallholder	0.917	50.000	4	2	5
Place attachment	0.167	69.444	1	6	7